

Application Number 10/052,861
Amendment dated April 7, 2004
Reply to Office Action of November 7, 2003

Amendments to the Claims

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims

1. (Currently Amended) A temperature control system for a workpiece chuck, comprising:
 - a circulating unit connected to the chuck for circulating a temperature control fluid through the chuck, the temperature control fluid being used to control the temperature of the chuck;
 - a refrigeration system in thermal communication with the temperature control fluid ~~for controlling temperature of the temperature control fluid to control temperature in the chuck;~~
 - a fluid carrying system connected to the circulating unit and the chuck for circulating the temperature control fluid through the chuck, the fluid carrying system comprising a plurality of at least partially separated fluid paths connected to a respective plurality of fluid input ports in a respective plurality of portions of the chuck such that temperature is controlled in the plurality of portions of the chuck;
 - a plurality of temperature sensors for sensing the temperature of the temperature control fluid and the chuck, the plurality of temperature sensors generating a respective plurality of temperature signals ~~being used by the refrigeration system to control the temperature of the temperature control fluid and the chuck;~~ and
 - a controller coupled to the temperature sensors for receiving the temperature signals from the temperature sensors, the controller using the temperature signals to control the temperature of the temperature control fluid and the chuck, the controller also being coupled to the fluid carrying system such that the controller, in controlling the temperature of the temperature control fluid, can switch ~~for switching~~ a flow path of the

temperature control fluid such that the temperature control fluid at least partially bypasses the refrigeration system.

2. (Original) The temperature control system of claim 1, further comprising a heater in the chuck for heating the chuck.
3. (Original) The temperature control system of claim 1, wherein the refrigeration system comprises means for coupling hot gas around a first heat exchanger to a second heat exchanger to bypass at least partially the first heat exchanger to heat the temperature control fluid.
4. (Original) The temperature control system of claim 1, further comprising a fluid heater for heating the temperature control fluid.
5. (Original) The temperature control system of claim 4, further comprising means for switching the temperature control fluid to bypass at least partially the fluid heater.
6. (Currently Amended) A method of controlling temperature in a workpiece chuck, comprising:

connecting a circulating unit to the chuck to circulate a temperature control fluid through the chuck, the temperature control fluid being used to control the temperature of the chuck;

coupling a refrigeration system to the temperature control fluid ~~to control temperature of the temperature control fluid to control temperature in the chuck;~~

connecting a fluid carrying system to the circulating unit and the chuck to circulate the temperature control fluid through the chuck, the fluid carrying system comprising a plurality of at least partially separated fluid paths connected to a respective

plurality of fluid input ports in a respective plurality of portions of the chuck such that temperature is controlled in the plurality of portions of the chuck;

sensing a temperature of the temperature control fluid;

sensing a temperature of the chuck;

using the sensed temperatures of the temperature control fluid and the chuck to control temperature of the temperature control fluid and the chuck; and
in controlling the temperature of the temperature control fluid, controlling the fluid carrying system to switch a flow path of the temperature control fluid such that the temperature control fluid at least partially bypasses the refrigeration system.

7. (Original) The method of claim 6, further comprising providing a heater in the chuck for heating the chuck.
8. (Original) The method of claim 6, further comprising coupling hot gas around a first heat exchanger of the refrigeration system to a second heat exchanger of the refrigeration system to bypass at least partially the first heat exchanger to heat the temperature control fluid.
9. (Original) The method of claim 6, further comprising providing a fluid heater for heating the temperature control fluid.
10. (Original) The method of claim 9, further comprising switching the temperature control fluid to bypass at least partially the fluid heater.
11. (Currently Amended) A temperature control system for a workpiece chuck, comprising:
a circulating unit connected to the chuck for circulating a temperature control fluid through the chuck, the temperature control fluid being used to control the

temperature of the chuck;

a refrigeration system in thermal communication with the temperature control fluid ~~for controlling temperature of the temperature control fluid to control temperature in the chuck~~, the refrigeration system including first and second heat exchangers for exchanging heat with the temperature control fluid;

a fluid carrying system connected to the circulating unit and the chuck for circulating the temperature control fluid through the chuck, the fluid carrying system comprising a plurality of at least partially separated fluid paths connected to a respective plurality of fluid input ports in a respective plurality of portions of the chuck such that temperature is controlled in the plurality of portions of the chuck;

a plurality of temperature sensors for sensing the temperature of the temperature control fluid and the chuck, the plurality of temperature sensors generating a respective plurality of temperature signals ~~being used by the refrigeration system to control the temperature of the temperature control fluid and the chuck;~~ and

a controller coupled to the refrigeration system for coupling hot gas around the first heat exchanger to the second heat exchanger to bypass at least partially the first heat exchanger to heat the temperature control fluid, the controller being coupled to the temperature sensors for receiving the temperature signals from the temperature sensors, the controller using the temperature signals to control the temperature of the temperature control fluid and the chuck, the controller also being coupled to the fluid carrying system such that the controller, in controlling the temperature of the temperature control fluid, can switch a flow path of the temperature control fluid such that the temperature control fluid at least partially bypasses the refrigeration system.

12. (Original) The temperature control system of claim 11, further comprising a heater in the chuck for heating the chuck.

13. (Original) The temperature control system of claim 11, further comprising a fluid heater for heating the temperature control fluid.
14. (Original) The temperature control system of claim 13, further comprising means for switching the temperature control fluid to bypass at least partially the fluid heater.
15. (Currently Amended) A method of controlling temperature in a workpiece chuck, comprising:
 - connecting a circulating unit to the chuck to circulate a temperature control fluid through the chuck, the temperature control fluid being used to control the temperature of the chuck;
 - connecting a fluid carrying system to the circulating unit and the chuck to circulate the temperature control fluid through the chuck, the fluid carrying system comprising a plurality of at least partially separated fluid paths connected to a respective plurality of fluid input ports in a respective plurality of portions of the chuck such that temperature is controlled in the plurality of portions of the chuck;
 - coupling a refrigeration system to the temperature control fluid ~~to control temperature of the temperature control fluid to control temperature in the chuck;~~
 - providing first and second heat exchangers in the refrigeration system for exchanging heat with the temperature control fluid;
 - sensing a temperature of the temperature control fluid;
 - sensing a temperature of the chuck;
 - using the sensed temperatures of the temperature control fluid and the chuck to control temperature of the temperature control fluid and the chuck; ~~and~~
 - in controlling the temperature of the temperature control fluid, controlling the fluid carrying system to switch a flow path of the temperature control fluid such that the temperature control fluid at least partially bypasses the refrigeration system; and

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coupling hot gas around the first heat exchanger to the second heat exchanger to bypass at least partially the first heat exchanger to heat the fluid.

16. (Original) The method of claim 15, further comprising providing a heater in the chuck for heating the chuck.
17. (Original) The method of claim 15, further comprising providing a fluid heater for heating the temperature control fluid.
18. (Original) The method of claim 17, further comprising switching the temperature control fluid to bypass at least partially the fluid heater.